

**FranklinWH Energy Storage Inc**

# RF TEST REPORT

**Report Type:**

FCC Part 15.247 RF report

**Model:**

aGate X

**REPORT NUMBER:**

230201553SHA-002

**ISSUE DATE:**

June 12, 2023

**DOCUMENT CONTROL NUMBER:**

TTRF15.247-02\_V1 © 2018 Intertek



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Dongguan City, Guangdong Province, China

**FCC ID:** 2BCMR-AGATEX01US

**SUMMARY:**

The equipment complies with the requirements according to the following standard(s) or Specification:

**47CFR Part 15:** Radio Frequency Devices (Subpart C)

**ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

**PREPARED BY:**

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Project Engineer  
Sky Yang

**REVIEWED BY:**

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Reviewer  
Wakeyou Wang

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## TEST REPORT

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## Revision History

Report No.	Version	Description	Issued Date
230201553SHA-002	Rev. 01	Initial issue of report	June 12, 2023

## Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	Pass
Power spectrum density	15.247(e)	Pass
Emission outside the frequency band	15.247(d)	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	Pass
Power line conducted emission	15.207(a)	Pass
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable

## 1 GENERAL INFORMATION

### 1.1 Description of Equipment Under Test (EUT)

Product name:	aGate
Type/Model:	aGate X
Description of EUT:	The EUT is an Energy storage control system which supports WiFi (802.11a/g mode), BLE and LTE function. LTE function uses a certified module, the FCC ID is XMR201909EC25AFX, the IC ID is 10224A-2019EC25AFX.
Rating:	120/208VAC; 120V/240VAC
Category of EUT:	Class B
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Sample No:	S202302211111-ZJA01/2
Software Version:	V1.4.1
Hardware Version:	1.1
Sample received date:	February 21, 2023
Date of test:	May 16 to May 18, 2023

### 1.2 Technical Specification

Frequency Band:	2400MHz ~ 2483.5MHz
Support Standards:	Bluetooth LE
Type of Modulation:	GFSK
Channel Number:	40 (0 - 39)
Data Rate:	1Mbps
Channel Separation:	2 MHz
Antenna Information:	1.74dBi, PCB Antenna

### 1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

All tests were sub-contracted.

#### **Shenzhen UnionTrust Quality and Technology Co., Ltd.**

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng Science and Technology Park, Longhua District, Shenzhen, China 518109

Telephone: +86 (0) 755 282 0888

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All tests were sub-contracted at Shenzhen UnionTrust Quality and Technology Co., Ltd, and conducted by Dylan Zhang

Reviewed and approved by Wakeyou Wang from Intertek Testing Services Shanghai.

#### **The test facility is recognized, certified, or accredited by the following organizations:**

##### **CNAS-Lab Code: L9069**

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.



**TEST REPORT****IC-Registration No.: 21600-1**

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

**A2LA-Lab Certificate No.: 4312.01**

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**FCC Accredited Lab.**

Designation Number: CN1194

Test Firm Registration Number: 259480

**ISED Wireless Device Testing Laboratories**

CAB identifier: CN0032

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## 2 TEST SPECIFICATIONS

### 2.1 Standards or specification

47CFR Part 15

ANSI C63.10 (2013)

KDB 558074 (v05r02)

### 2.2 Mode of operation during the test

The lowest, middle and highest channel were tested as representatives.

Frequency Range (MHz)				2402 ~ 2480			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

#### Data rate VS Power:

The test setting software is offered by the applicant. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software			
Test Software	WCN Combo Tool.exe		
Power Setting (Provided by the customer)	Power Setting: not applicable, test used software default power level.		
Working Mode	BLE		
Test Channel	2402MHz	2440MHz	2480MHz

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Radiated test mode: EUT transmitted signal with BT antenna;

Conducted test mode: EUT transmitted signal from BT RF port connected to SPA directly;

## TEST REPORT

### 2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	e3	Audix	9.160323
Radiated emission	e3	Audix	9 20151119i

### 2.4 Test peripherals list

Item No.	Name	Band and Model	S/N number
1	Laptop computer	Lenovo E450	SL10G10780

### 2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	23.4°C	52.5% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	22.5°C	56.2% RH
Power line conducted emission	23.5°C	49.6% RH

## 2.6 Instrument list

Conducted Emission						
Used	Equipment	Manufacturer	Type	Internal no.	Cal. date	Due date
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	101181	Nov. 1, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 1, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	LISN	R&S	ESH2-Z5	860014/024	Nov. 1, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9 20151119i		
Radiated Emission						
Used	Equipment	Manufacturer	Type	Internal no.	Due date	Due date
<input checked="" type="checkbox"/>	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT001270-1317	Jan. 22, 2021	Jan. 21, 2024
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	Nov. 3, 2022	Nov. 2, 2023
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 21, 2022	Nov. 20, 2023
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec.13, 2022	Dec.12, 2023
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	18103001	Dec.13, 2022	Dec.12, 2023
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	Nov. 1, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	Apr. 16, 2023	Apr. 15, 2025
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	00118385	00201874	Nov. 1, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Nov. 21, 2022	Nov. 20, 2023
<input checked="" type="checkbox"/>	Preamplifier	ETS-LINDGREN	00118384	00202652	Nov. 21, 2022	Nov. 20, 2023
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		
RF test						
Used	Equipment	Manufacturer	Type	Internal no.	Due date	Due date
<input checked="" type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9020A	MY51286807	Nov. 1, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	Nov. 3, 2022	Nov. 2, 2023

## 2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.2 dB
2	Conducted emission 150KHz-30MHz	±2.7 dB
3	Radiated emission 9KHz-30MHz	±4.7 dB
4	Radiated emission 30MHz-1GHz	±4.6 dB
5	Radiated emission 1GHz-18GHz	±4.4 dB
6	Radiated emission 18GHz-40GHz	±4.6 dB
8	Radio frequency	2.4 GHz: $\pm 6.5 \times 10^{-8}$
9	Occupied Channel Bandwidth	± 1.86 %
10	RF output power, conducted	± 0.68 dB
11	Power Spectral Density	± 0.6 dB
12	Spurious emissions, conducted	± 2.7 dB
13	Time	± 0.19 %

### 3 Minimum 6dB bandwidth

Test result: Pass

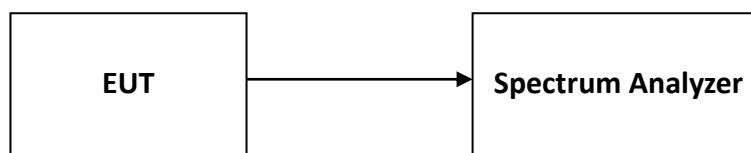
#### 3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

#### 3.2 Measurement Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 3.3 Test Configuration



#### 3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

## 4 Maximum conducted output power.

**Test result:** Pass

### 4.1 Limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands:  
1 W. (The e.i.r.p. shall not exceed 4 W)

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

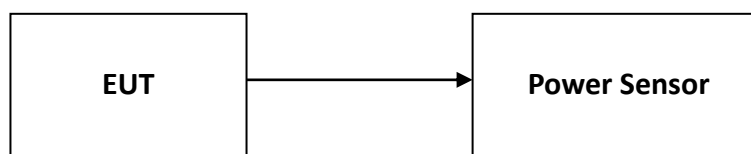
### 4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 9.1.3) for compliance requirements.

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
2. Measure out each test modes' peak or average output power, record the power level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

### 4.3 Test Configuration



### 4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

## 5 Power spectrum density

**Test result:** Pass

### 5.1 Limit

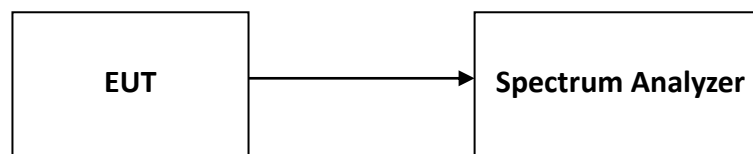
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and  $8 + (6 - \text{antenna gain} - \text{beam forming gain})$ .

### 5.2 Measurement Procedure

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 5.3 Test Configuration



### 5.4 Test Results of Power spectrum density

Please refer to Appendix A



## 6 Emission outside the frequency band

**Test result:** Pass

### 6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

### 6.2 Measurement Procedure

#### Reference level measurement

Establish a reference level by using the following procedure:

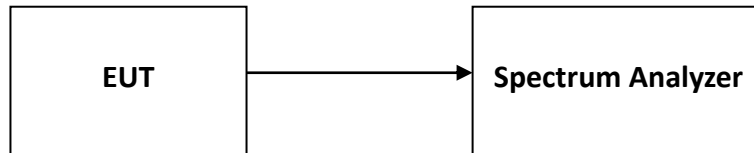
- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to  $\geq 1.5$  times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW  $\geq 3 \times$  RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

#### Emission level measurement

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW  $\geq 3 \times$  RBW.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

### 6.3 Test Configuration



### 6.4 The results of Emission outside the frequency band

Please refer to Appendix A

## 7 Radiated Emissions in restricted frequency bands

**Test result:** Pass

### 7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

### 7.2 Measurement Procedure

#### For Radiated emission below 30MHz:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

**TEST REPORT****For Radiated emission above 30MHz:**

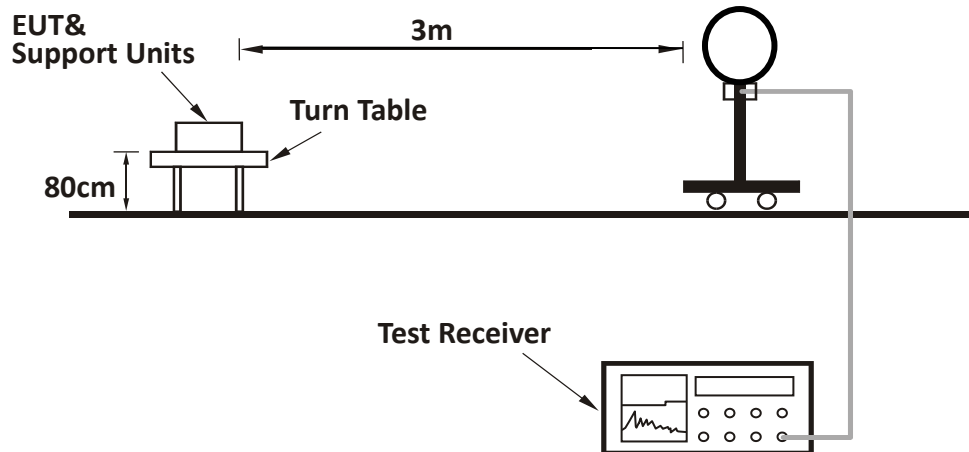
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

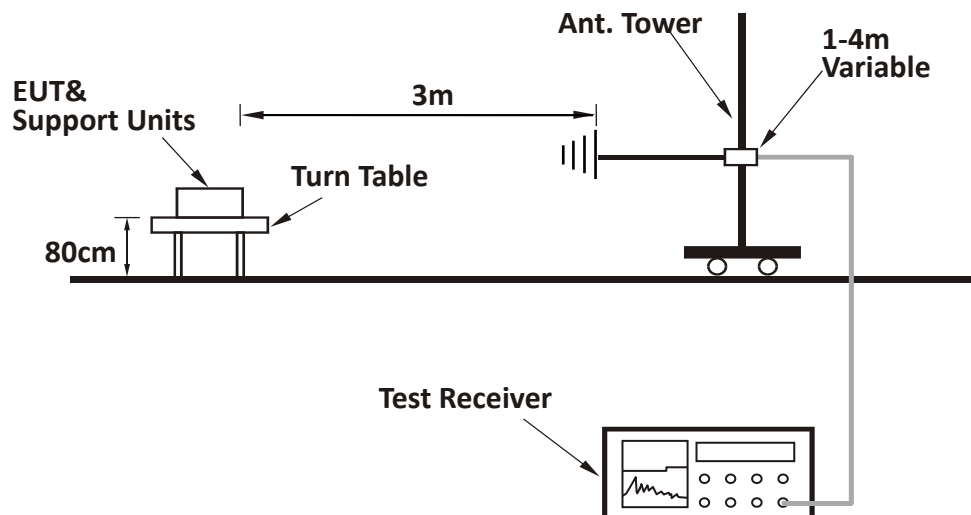
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or  $3 \times \text{RBW}$  (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported

### 7.3 Test Configuration

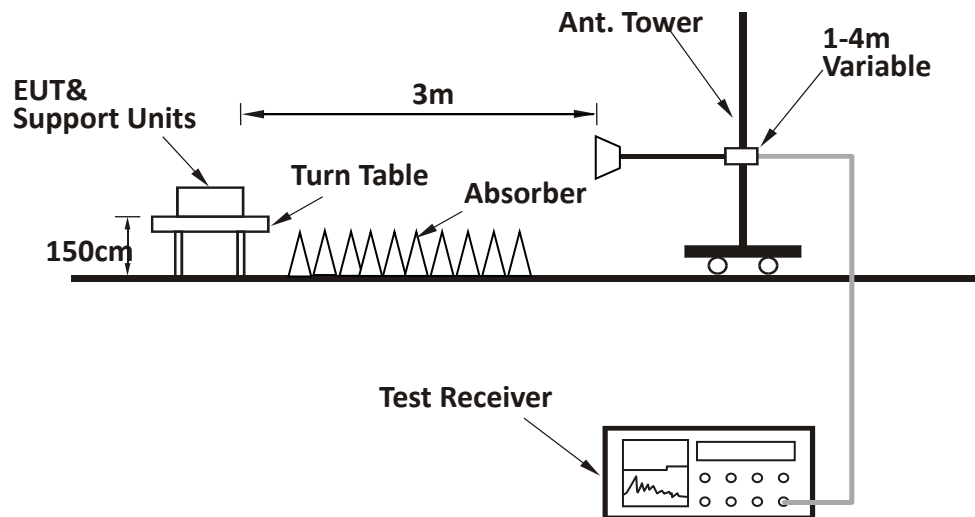
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



**For Radiated emission above 1GHz:**

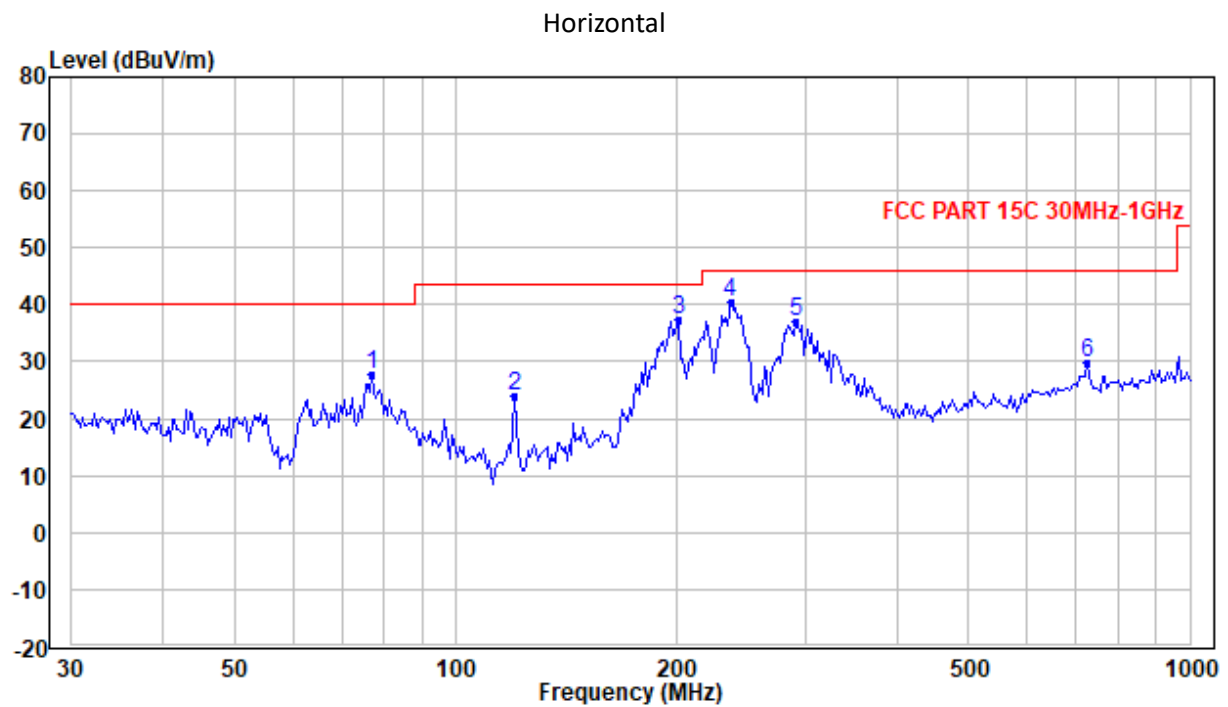


## TEST REPORT

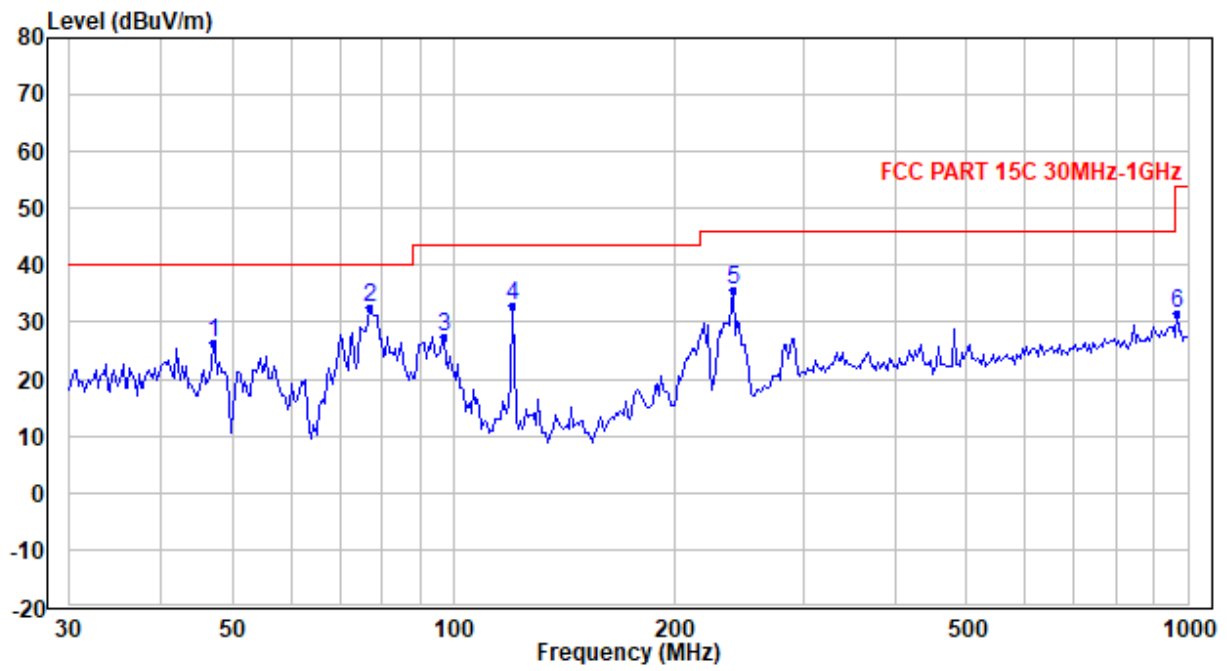
### 7.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

We test all models and the worst waveform from 30MHz to 1000MHz is listed as below:



Vertical





# TEST REPORT

## Test data 30MHz~1GHz:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Factor (dB/m)	Limits (dBμV/m)	Margin (dB)	Detector
H	76.926	27.72	-17.29	40.00	12.28	QP
	120.612	23.91	-16.26	43.50	19.59	QP
	201.454	37.55	-10.45	43.50	5.95	QP
	236.793	40.34	-9.57	46.00	5.66	QP
	290.317	36.90	-7.36	46.00	9.10	QP
	723.793	29.77	1.44	46.00	16.23	QP
V	47.037	26.25	-12.51	40.00	13.75	QP
	76.926	32.45	-17.29	40.00	7.55	QP
	97.002	27.46	-16.14	43.50	16.04	QP
	120.612	33.04	-16.26	43.50	10.46	QP
	240.144	35.80	-9.09	46.00	10.20	QP
	965.474	31.70	4.54	54.00	22.30	QP

## Remark:

- Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
- Measured level= Original Receiver Reading + Factor
- Margin = Limit – Measured level
- All possible modes of operation were investigated, only the worst-case emissions reported.

**Radiated Emission Test Data (Above 1GHz):**
**Lowest Channel:**

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	2390.00	50.46	-8.30	42.16	74.00	31.84	Peak	Horizontal
2	2390.00	37.03	-8.30	28.73	54.00	25.27	Average	Horizontal
3	4804.00	38.75	-1.40	37.35	74.00	36.65	Peak	Horizontal
4	4804.00	27.66	-1.40	26.26	54.00	27.74	Average	Horizontal
5	7206.00	36.43	1.30	37.73	74.00	36.27	Peak	Horizontal
6	7206.00	25.34	1.30	26.64	54.00	27.36	Average	Horizontal
7	2390.00	50.73	-8.30	42.43	74.00	31.57	Peak	Vertical
8	2390.00	37.98	-8.30	29.68	54.00	24.32	Average	Vertical
9	4804.00	38.92	-1.40	37.52	74.00	36.48	Peak	Vertical
10	4804.00	27.54	-1.40	26.14	54.00	27.86	Average	Vertical
11	7206.00	37.26	1.30	38.56	74.00	35.44	Peak	Vertical
12	7206.00	25.49	1.43	26.79	54.00	27.21	Average	Vertical

**Middle Channel:**

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4880.00	26.93	3.92	25.55	54.00	28.45	Average	Horizontal
2	4880.00	37.87	3.92	36.49	74.00	37.51	Peak	Horizontal
3	7320.00	24.34	4.84	25.64	54.00	28.36	Average	Horizontal
4	7320.00	36.36	4.84	37.66	74.00	36.34	Peak	Horizontal
5	4880.00	26.99	3.92	25.61	54.00	28.39	Average	Vertical
6	4880.00	39.03	3.92	37.65	74.00	36.35	Peak	Vertical
7	7320.00	26.01	4.84	27.31	54.00	26.69	Average	Vertical
8	7320.00	38.45	4.84	39.75	74.00	34.25	Peak	Vertical

Highest Channel:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	2483.50	58.44	3.96	50.52	74.00	23.48	Peak	Horizontal
2	2483.50	51.85	3.96	43.93	54.00	10.07	Average	Horizontal
3	4960.00	37.59	3.96	36.25	74.00	37.75	Peak	Horizontal
4	4960.00	25.57	3.96	24.23	54.00	29.77	Average	Horizontal
5	7440.00	38.80	4.95	40.10	74.00	33.90	Peak	Horizontal
6	7440.00	26.98	4.95	28.28	54.00	25.72	Average	Horizontal
7	2483.50	63.95	3.96	56.03	74.00	17.97	Peak	Vertical
8	2483.50	58.45	3.96	50.53	54.00	3.47	Average	Vertical
9	4960.00	38.11	3.96	36.77	74.00	37.23	Peak	Vertical
10	4960.00	26.01	3.96	24.67	54.00	29.33	Average	Vertical
11	7440.00	39.94	4.95	41.24	74.00	32.76	Peak	Vertical
12	7440.00	35.91	4.95	28.53	54.00	25.47	Average	Vertical

- Remark: 1. Correction Factor = Antenna Factor + Cable Loss (- Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.  
 2. Corrected Reading = Original Receiver Reading + Correct Factor  
 3. Margin = Limit - Result  
 4. If the PK Result is lower than AV limit, the AV test can be elided.

## 8 Power line conducted emission

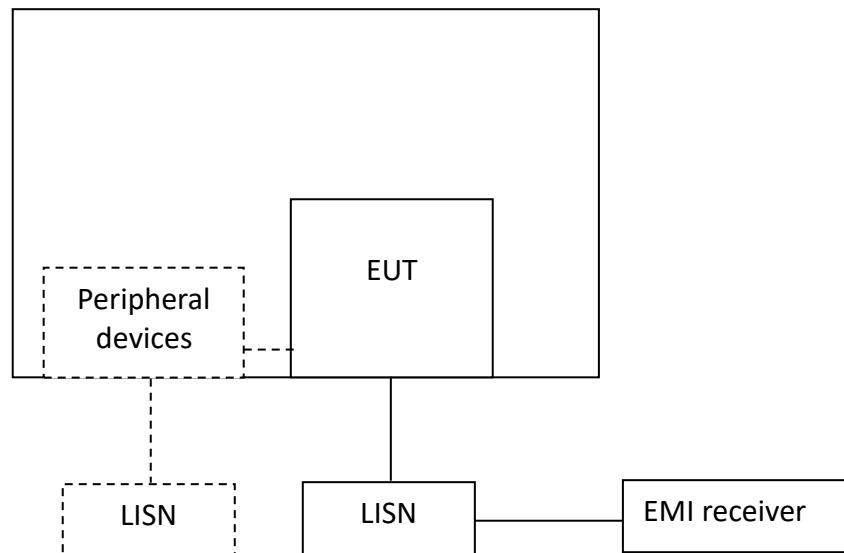
Test result: Pass

### 8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### 8.2 Test Configuration



### 8.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50  $\Omega$  LISN port (to which the EUT is connected), where permitted, terminated into a 50  $\Omega$  measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50  $\Omega$  measuring port is terminated by a measuring instrument having 50  $\Omega$  input impedance. All other ports are terminated in 50  $\Omega$  loads.

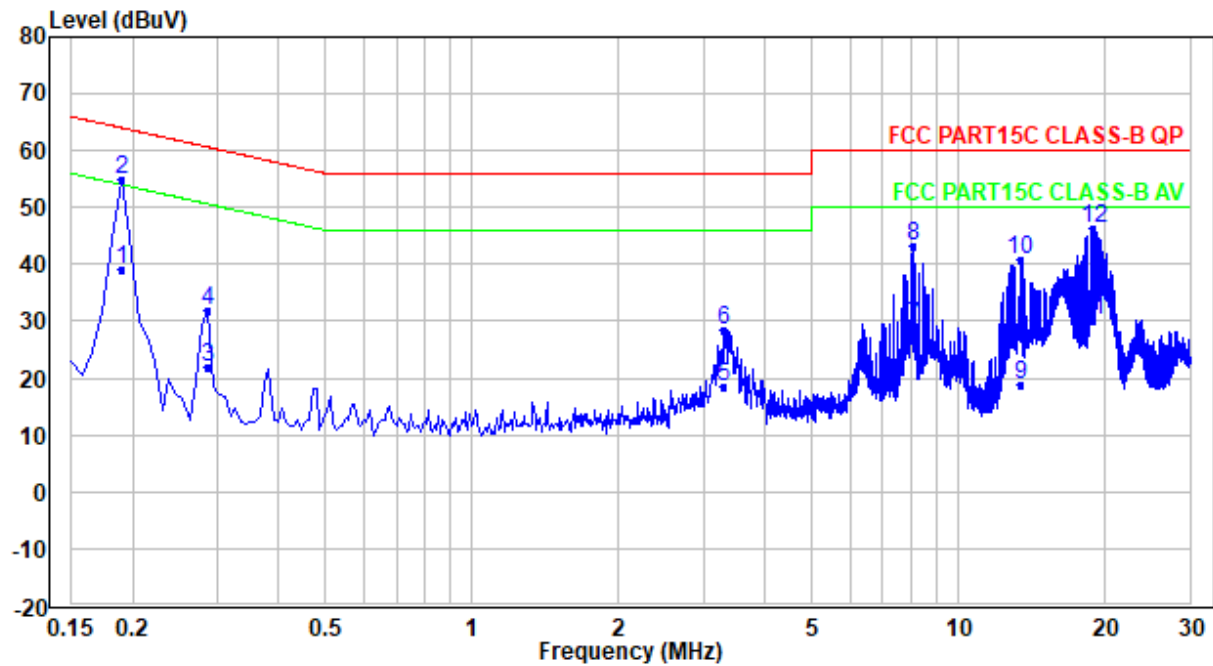
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

## 8.4 Test Results of Power line conducted emission

Test Curve:

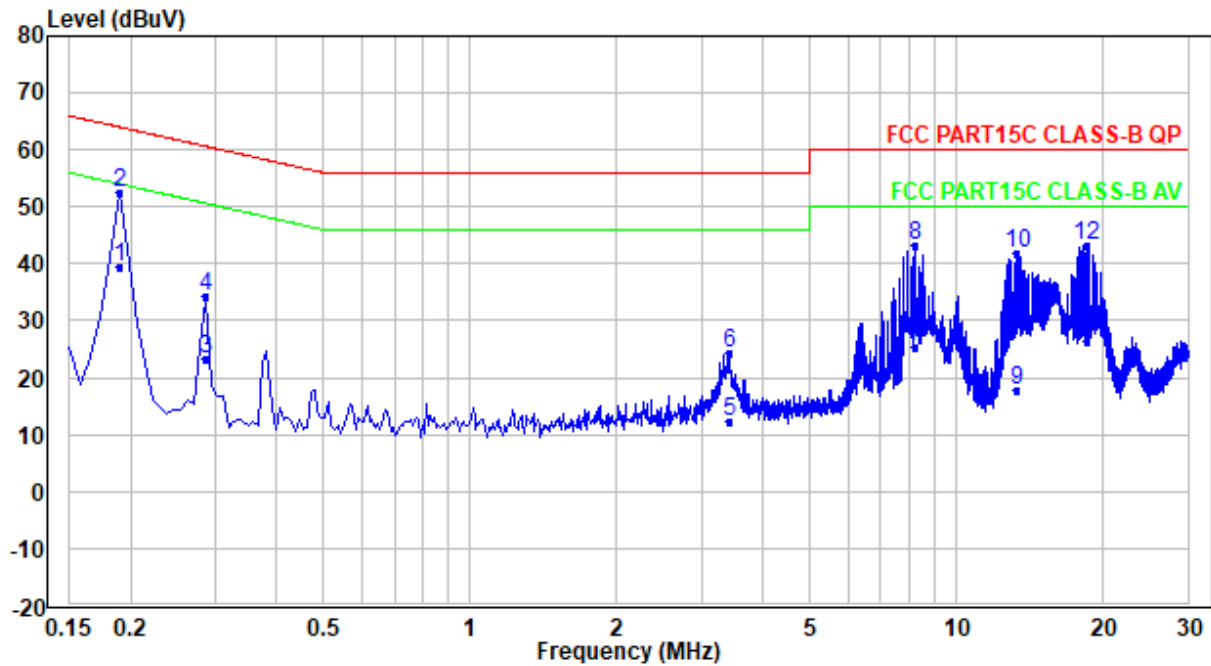
L Line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	Level dB( $\mu$ V)	Limit dB( $\mu$ V)	Margin (dB)	Level dB( $\mu$ V)	Limit dB( $\mu$ V)	Margin (dB)
0.190	55.08	64.04	8.96	39.08	54.04	14.96
0.286	32.03	60.64	28.61	22.03	50.64	28.61
3.301	28.37	56.00	27.63	18.37	46.00	27.63
8.124	43.06	60.00	16.94	29.06	50.00	20.94
13.403	40.66	60.00	19.34	18.66	50.00	31.34
18.914	46.33	60.00	13.67	30.33	50.00	19.67

N Line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	Level dB(μV)	Limit dB(μV)	Margin (dB)	Level dB(μV)	Limit dB(μV)	Margin (dB)
0.190	52.62	64.04	11.42	39.62	54.04	14.42
0.286	34.32	60.64	26.32	23.32	50.64	27.32
3.413	24.41	56.00	31.59	12.41	46.00	33.59
8.204	43.36	60.00	16.64	25.36	50.00	24.64
13.299	41.74	60.00	18.26	17.74	50.00	32.26
18.538	43.30	60.00	16.70	26.30	50.00	23.70

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Level = Original Receiver Reading + Factor

3. Margin = Limit - Level

4. If the PK Level is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,  
Limit = 40.00dBuV/m.  
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;  
Level = 10dBuV + 0.20dB/m = 10.20dBuV/m;  
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

## 9 Antenna requirement

### **Requirement:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

### **Result:**

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.



## Appendix A: Test results

Refer to Appendix A for test results.

\*\*\*\*\* END \*\*\*\*\*